

# COMPANY PROFILE



Surface Technology, Inc.

## Surface Technology, Inc. began as a small family business during the recession in the early 1970s. Deeply rooted in history and innovation, the company has evolved into a world leader in composite electroless coatings.

By Anna Claire Howard

In the early '70s near the end of the Vietnam War, the U.S. was mired in a downward economic spiral. As unemployment and inflation rose, so did the nation's dependence on foreign oil. Emerging global competition in the metal industry triggered a steel crisis.

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However, despite being surrounded by economic chaos and unrest, Dr. Nathan Feldstein took hold of his own destiny and opened the doors of Surface Technology, Inc., in 1973. The steel crisis catalyzed the plastics revolution, causing major industries, such as airline and automotive, to replace heavy metal parts with lighter plastic ones. But there still needed to be a way to apply metal coating to these non-conductors; the technology for that was not well developed.

At least not until Surface Technology addressed this need.

"Our company developed a lot of the key technology on how to more effectively activate plastic in order to achieve a metallurgical bond of a subsequent coating," said Michael Feldstein, son of the company's founder and current president and director of innovation at Surface Technology. "The technology that we developed at the outset was focused on how to coat non-metallic items. They've been coating metallic things for centuries. Coating non-metallic items, however, was a whole other story."

As the company became more involved in this revolutionary endeavor, it became apparent that there wasn't only a demand for coatings on nonconductors, but there was also a growing need for advanced coatings.

According to Feldstein, that meant coatings that didn't just have the properties of the metal in the coating — such as nickel, chrome, or nickel-phosphorous — but coatings that also had synergistic properties.

Surface Technology worked toward developing the process of incorporating fine diamond particles into the metal coatings for enhanced hardness, wear resistance, and heat transfer, and other materials such as ceramics and polymers into coatings that required low friction or release features.

The utility of such advanced coatings is often most advantageous on more intricate parts with complex geometries. That required overcoming a number of significant inherent challenges, including stepping away from the age-old practice of coating metals by electroplating, which is when electricity is used to make the coating adhere to the metal object.

"It's electroless," Feldstein said. "It's a sophisticated chemical reaction from a water-based bath that has dissolved metal salts and chemical reducing agents to get the metal to deposit onto the part. Since it's a chemical reaction, it will work perfectly

uniformly onto whatever the shape. Very complicated shapes, very tiny devices, very large devices—it doesn't matter."

In other words, the chemistry is blind.

"And to make it work on a commercially reliable basis, our company pioneered the use of certain surfactants, dispersants, and wetting agents that could be put into the plating bath and disperse with the particles themselves so that when the particles went into the hot chemical reactive plating bath they didn't overreact or coat onto themselves like a snowball and then settle out. That is an area that to this day we're the world leader, and it's given us the opportunity to come up with the broadest array of these composite coatings. Since the coating onto nonconductors has been solved for decades, the area where we continue to grow with new opportunities every year is different versions of these composite coatings and different types of materials that can go into the coating to give it different properties in addition to the basic hardness, corrosion-resistance, and wear resistance of the nickel coating itself."

That is particularly beneficial to the gear manufacturing industry.

A gear has a complicated geometry, so electroplating of gears is cumbersome at best and often impossible. That's because when an electric current is applied to a gear, there will be more of an electric current at the tips of the gear teeth and less at the trough between them, resulting in an uneven coating.

However, Surface Technology's electroless method solved that problem by creating a coating envelope precisely around the profile of the gear. Since gears are often used in large volume applications, this is a way of batch coating many at a time and resulting in every single one being identical and being able to coat to very tight tolerances.

"Gears are a fascinating piece of equipment because a gear can be found in any climate in any industry in any application under countless usage conditions," Feldstein said. "There are so many different needs for gears. By adding particles to the coating, it's generally useful to have a harder, more wear-resistant, and corrosion-resistant coating. It certainly never hurts.

"But being able to add other materials to enhance the properties of that is also something that gears very often require. Whether it's gears that are used in scientific equipment that we often do where they have to glide very smoothly and by putting something like Teflon® into our coating, it helps them accomplish that. Or, with gears that are used in pumping applications and mining applications, putting diamond into the coating makes it much more wear-resistant than hard chrome plating."

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Another benefit from using Surface Technology's electroless coating method comes with how it extends the life of the gear.

"One of the advantages of our type of coating that we have perfected over recent years is being able to coat the gears and then strip off the coating," Feldstein said. "Let's say a customer has an application where they

know that with our coating they'll get two years of lifetime, but after 21 months with three months to go, they can send it back to us, we'll strip the coating off, meaning that we dissolve off the coating with chemicals and put on a new one. We're not hurting the gear or grinding it off. Then, that same original gear is good for another two years,

and they haven't had to buy a new gear. So, not only is it environmentally friendly, but it's also pocketbook friendly."

While they remained a plating shop like they were when Feldstein's father started the business in 1973, their pioneering advancements in coating solutions required more than what was readily available. This meant that Surface Technology had to make its own chemicals for internal use in its plating shop.

This led to the second side of Surface Technology's business—selling their own chemicals to other coating shops around the world.

"There's this great synergy because with the companies that send us these parts for coating, we're using our own chemicals, which it makes it more economical," Feldstein said. "We're able to insure the quality of what we're doing, and we can tailor it for specific applications and optimize the coating for their need."

"For the users of our chemical solutions, we're also able to give them firsthand practical knowledge on how to do the coatings. When they buy the chemistry from us, we can give them that firsthand knowledge on how to operate the chemical process. More broadly, we can give our customers best practice advice on all aspects of running a plating shop. Often our customers contact us asking for advice on some other aspect of the coating shop, like 'what kind of exhaust fan should we buy,' or, 'how do you pre-treat a certain kind of aluminum alloy before coating?'"

Surface Technology's coating technology falls into three main areas, whether they're doing it at their facility in Robbinsville, New Jersey, or selling it to a third party.

The first is the Composite Diamond Coating<sup>®</sup>, which consists of electroless nickel and a very fine diamond that can produce coatings ranging from ultra smooth with nanometer-sized diamond to smooth coatings with micron-sized diamond particles and all the way up to textured surfaces with grit size diamond.

"One of the important areas for gears is when they are used in erosive applications, when there's any kind of particulate or slurry abrasive involved," Feldstein. "By us changing the size and density of the diamond in the coating, it can make it more resistant to erosion."

The second is a composite coating with lubricating particles that reduces friction in

The Solution



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critical applications; a feature very useful in many gear applications.

And the third is one of Surface Technology's latest developments — TraceCoat®.

This is a composite coating just like the first two types, but instead of using hard particles or low-friction particles, TraceCoat uses forensic particles — ones that can't be heard, seen, or smelled. While these particles remain hidden, they can be detected with a small electronic reader that is roughly the size of a television remote control, and they're able to verify the gear's authenticity.

"You can have a gear that looks exactly like any other gear, but if it has this secret material inside the coating, the detector will tell you if it's there," Feldstein said. "In fact, there are about 30 different materials that each has a unique signature that can be picked up by this reader. So if it's a gear that's going onto an airplane, or onto a M1 tank, an automobile, or whatever it is that's a critical application, this is a way for the end user to verify that it's real or not. Obvi-

ously, gears can be made by CNC machines and somebody can easily counterfeit something that looks convincing, but you don't know if the alloy, stress or other internal properties of the underlying gear are right."


Surface Technology also sells a TraceCoat additive so that other companies can use it in their own metal coatings. Additionally, due to further recent innovations, all of Feldstein's composite coatings, including TraceCoat, are available in black versions, which is key with firearm applications and other applications where the coating needs a black aesthetic.

These composite coatings can be found in a wide range of industries all over the world aside from gear manufacturing, including aerospace, automotive, oil & gas, food processing, pharmaceutical, and namely the textile industry where there are gearing and spinning-related applications that especially benefit from Surface Technology's Composite Diamond Coating.

Ultimately, while Surface Technology is proud to sell these products to the people

who need it, Feldstein said they are primarily focused on research and development and continuing the legacy his father left behind.

"Before my father passed, he had over 100 patents to his name and served as his own patent agent," Feldstein said. "He was prolific as an inventor. So, we do a lot of contract research and development because we have so many patents and so much know-how in this area of electroless nickel coating and composite electroless nickel coating.

"We're not trying to be a major sales organization. We're a technology company with outstanding production and chemical capabilities. We're focused on that, and we don't ever pretend to be something we're not." 

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**FOR MORE INFORMATION**, contact Surface Technology, Inc. at (609) 259-0099 or at [info@surfacetechology.com](mailto:info@surfacetechology.com), or go online to [www.surfacetechology.com](http://www.surfacetechology.com).